

AD-A106 321

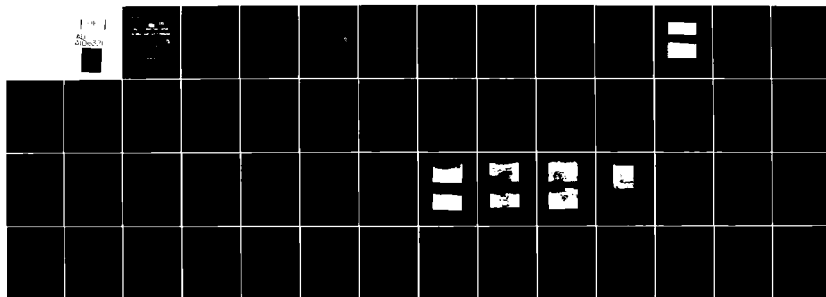
SCHNABEL ENGINEERING ASSOCIATES RICHMOND VA  
NATIONAL DAM SAFETY PROGRAM, SLEETER LAKE DAM (INVENTORY NUMBER--ETC(U)  
MAY 81 R E MARTIN, C S ANDERSON, J G STARR

F/G 13/13

DACW65-81-D-0020

NL

UNCLASSIFIED



END  
DATE  
FILMED  
11-81  
DTIC

POTOMAC RIVER BASIN

Name Of Dam:

SLATTERY LAKE DAM

Location:

LOUDOUN COUNTY, VIRGINIA

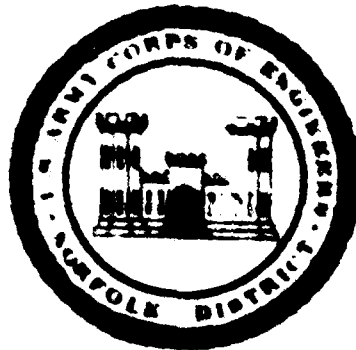
Inventory Number:

VA. NO. 10710

LEVEL

# PHASE I INSPECTION REPORT

## NATIONAL DAM SAFETY PROGRAM



DTIC  
OCT 28 1981  
H

AD A106321

PREPARED FOR

NORFOLK DISTRICT CORPS OF ENGINEERS  
800 FRONT STREET  
NORFOLK, VIRGINIA 23510

BY

ROBBER ENGINEERING ASSOCIATES, P.C.  
J. K. TIDWELL AND ASSOCIATES, INC.

MAY 1981

81 10 27 324

FILE

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS DO NOT WRITE IN THESE SPACES
1. REPORT NUMBER	2. GOVT ACCESSION NO. <b>AD-MHC6</b>	3. REPORTING NUMBER <b>321</b>
4. TITLE (and Subtitle) Thesis - Inspection Report Air Force Research Office - Dayton		5. TYPE OF REPORT & PERIOD COVERED Final
6. AUTHOR		7. PERFORMING OR REPORT NUMBER
8. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Force Research Office - Dayton 2940 Broadway Dayton, Ohio 45423		9. CONTRACT OR GRANT NUMBER
10. PROGRAM ELEMENT PROJECT TASK AREA & SUBPROJECT		
11. REPORT DATE Mar 1961		
12. NUMBER OF PAGES 10		
13. SECURITY CLASSIFICATION Unclassified		
14. DECLASSIFICATION/DOWNGRADING SCHEDULE		
15. DISTRIBUTION STATEMENT (If any) Available to all personnel in the program. See also AD-MHC6-321 for details. Number of copies 100. For more information, see AD-MHC6-321.		

### Abstract

Consistent with the purpose of the Phase I Inspection Reports, the inspection of the dam is conducted in accordance with the recommended guidelines for safety inspection of dams. The inspection is conducted by a team of engineers, geologists, and hydrologists. The purpose of the Phase I inspection is to identify the existing conditions of the dam and to provide recommendations for further action. The assessment of the general condition of the dam is based on a visual inspection of the dam and on the results of investigations and analyses conducted by the inspection team. The investigation is conducted by the inspection team and by the dam owner. The investigation is intended to identify the existing conditions of the dam.

Report of the inspection of the dam is the first of the inspection and of the existing engineering data. The Phase I report addresses the existing engineering data, geology, geotechnical, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements for additional depth study when necessary.

Phase I reports include pertinent information of the dam opportunities, the existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and recommendations for required remedial measures.

REPORT OF INVESTIGATION  
NORFOLK DISTRICT COURT OF ENGINEERS

DTIC  
OCT 26 1981  
H

PREPARED FOR  
NORFOLK DISTRICT COURT OF ENGINEERS  
801 FRONT STREET  
NORFOLK, VIRGINIA 23510

BY

SCHWABEL ENGINEERING ASSOCIATES, P.C./  
J. K. TIMMONS AND ASSOCIATES, INC.

DISTRIBUTION STATEMENT A  
Approved for public release;  
Distribution Unlimited

# TABLE OF CONTENTS

	Page
Introduction . . . . .	i
General Description of Dam . . . . .	1
Overview Photos . . . . .	4
Section 1: PROJECT INFORMATION . . . . .	5
Section 2: CONSTRUCTING DATA . . . . .	9
Section 3: VISUAL INSPECTION . . . . .	11
Section 4: OPERATIONAL PROCEDURES . . . . .	15
Section 5: HYDRAULIC/HYDROLOGIC DATA . . . . .	16
Section 6: DAM STABILITY . . . . .	19
Section 7: ASSESSMENT/REMEDIAL MEASURES . . . . .	23

## Appendices:

- I - Maps and Drawings
- II - Photographs
- III - Field Observations
- IV - References

Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Avail and/or	
Dist	Special
A	

## INTRODUCTION

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, and surface investigations, testing, and detailed geotechnical evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

Project No. 1-0-1  
Project Name: Goose Creek Dam

Project No. 1-0-1  
Project Name: Goose Creek Dam

Location: Goose Lake Dam  
County: Garfield  
City: Panguitch  
State: Utah  
Latitude: 39° 07.25' N Long 111° 45.6' W  
Elevation: 7,000 ft  
Date of Report: May 4, 1981

The Goose Lake Dam is a gravity concrete structure about 1100 ft long and 55 ft high. The principal spillway consists of a 60 ft long concrete overflow weir which discharges into a trapezoidal shaped concrete channel with a 12 ft wide bottom. An earth emergency spillway is located at the right abutment with a 140 ft wide bottom and 2H:1V side slopes. The structure is classified intermediate in size and is assigned a significant hazard classification. The dam is located on the North Fork of Goose Creek approximately 1 mile south of Round Hill, Garfield. The dam is used for irrigation and recreational purposes and is owned and maintained by Mr. and Mrs. Charles L. Ewles.

Based on criteria established by the Department of the Army, Corps of Engineers (DCE), the appropriate Spillway Design Flood (SDF) is the 100 Year PEF. During the SDF the dam will be overtopped to a depth of 0.4 ft maximum, at a maximum velocity of 2.7 fps, and will be overtopped for a period of one hour. Flows overtopping the dam during the SDF are not considered detrimental with respect to erosion. The spillway is judged inadequate but not seriously inadequate.

The dam is in good condition and no major problems are visible which would require immediate attention. The dam is considered stable for normal ponding and no additional stability analysis is not required.

It is recommended that the owner implement an emergency action plan immediately of the date of this report in order to warn downstream of any dangers which may be imminent. Also, the dam should be inspected during unusually heavy precipitation and runoff.

The following routine maintenance and observation functions should be initiated as part of an annual maintenance program:

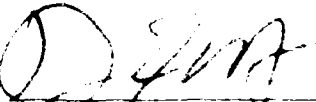
The grass and weeds on the embankment should be cut at least once a year and preferably twice a year. Maintenance is recommended in the early spring and fall. Existing trees on the dam should be cut to the ground. Trees greater than 3 inches in diameter should have their stumps and root structures removed and resulting holes backfilled.

Eroded areas in the principal spillway discharge channel should be stabilized. Erosion observed at pool level along the upstream slope should be corrected and riprap replaced as necessary. Animal burrows in the embankment should be backfilled.

Iron stained seepage present below the lake drain discharge pipe should be monitored quarterly to detect any flow which may cause piping within the embankment. The chimney drain outlet should be uncovered and flow monitored quarterly. A staff gage should be installed to monitor water levels.

Prepared by:

SCHNABEL ENGINEERING ASSOCIATES, P.C./  
J. K. TIMMONS & ASSOCIATES, INC.



Ray E. Martin, Ph.D., P.E.  
Commonwealth of Virginia

Submitted by:

Original signed by:  
Carl S. Anderson, Jr.

Carl S. Anderson, Jr., P.E.  
Acting Chief, Design Branch

Approved:

Original signed by:  
Ronald E. Hudson

Ronald E. Hudson  
Colonel, Corps of Engineers  
Commander and District Engineer

Recommended by:

Original signed by  
JAMES A. WALSH

for Jack G. Starr  
Chief, Engineering Division

Date: SEP 11 1981



Sleeter Lake



Dam

Overview Photographs

[illegible]

1.1.1 Authority: *Public Law 92-61, March 19, 1969, 82 Stat. 303*

the Secretary of the Army, through the Department of Defense, to coordinate a national program of military cooperation with the United States Armed Forces. In 1968, the Department of Defense, in cooperation with the Department of Health, Education and Welfare, reported the Department's plan for the "National Health Survey."

1.1.2 Purpose of Inspection: The purpose is to detect a listed inspection criteria violation, assess risk to the safety of the system of tanks (see Section 1, Appendix IV). The main responsibility is to expeditiously identify those items which may be a potential hazard to human life or property.

## 1.2 Project description

[illegible]

\* Here the  $\delta$  is the distance from the top of the well to the center of the sphere, and the  $\delta$  is the distance from the center of the sphere to the center of the well.

The principal spillway consists of a two stage overflow type structure (see Figures 1 and 2, Appendix III). The primary stage is a crest-mounted, sharp crested overflow weir in a rectangular 14 ft wide by 30 ft configuration. The primary weir is at elevation 495 msl and the weir crest height from 3 to 4 ft and discharges into a 14 ft wide by 30 ft deep concrete channel with a 12 ft wide bottom and 2H:1V slopes. The secondary stage of the principal spillway is a 12 ft wide earth channel located at the top of the first stage concrete channel (elevation 495 msl). The secondary stage transitions into a crest-mounted weir with 2H:1V side slopes. The two stage spillway discharges into an earth channel excavated to bedrock. The spillway channel intercepts the original stream bed at the top of the dam. A 12 inch diameter corrugated metal pipe (CMP) through the dam structure at elevation 440<sup>+</sup> msl is used to drain the lake. The drain pipe extends a distance north of approximately 350 ft (field sketch 1, Appendix III).

A secondary spillway (EMS) is located at the right abutment of the dam. The EMS is a trapezoidal earth channel with a 140 ft wide bottom at the control section and 2H:1V side slopes. The EMS control section is at elevation 494 msl (field sketch 2, Appendix III).

**Location:** The dam is located on the North Fork of the Roanoke River approximately 1 mile south of Round Hill, Virginia (Plate 1, Appendix III).

**Dam Size Classification:** The dam is classified as an intermediate size structure based on its height and maximum lake storage potential as defined in Reference 1, Appendix IV.

1.2.4 Construction: The dam was constructed by the Federal Bureau of Investigation, U.S. Department of Justice, under the supervision of the U.S. Army Corps of Engineers, District of Columbia. The dam was constructed by the U.S. Army Corps of Engineers, District of Columbia, under the supervision of the U.S. Army Corps of Engineers, District of Columbia. The dam was constructed by the U.S. Army Corps of Engineers, District of Columbia, under the supervision of the U.S. Army Corps of Engineers, District of Columbia.

1.2.5 Location: The dam is located on the Potomac River, between the cities of Washington, D.C. and Baltimore, Maryland. The dam is located on the Potomac River, between the cities of Washington, D.C. and Baltimore, Maryland. The dam is located on the Potomac River, between the cities of Washington, D.C. and Baltimore, Maryland.

1.2.6 Purpose: Recreation and irrigation.

1.2.7 Design and Construction: The dam was designed and constructed by the U.S. Army Corps of Engineers, District of Columbia, under the supervision of the U.S. Army Corps of Engineers, District of Columbia. The dam was constructed by the U.S. Army Corps of Engineers, District of Columbia, under the supervision of the U.S. Army Corps of Engineers, District of Columbia.

1.2.8 Normal Operational Procedures: The principal spillway is ungated, therefore, water rising above the crest of the primary weir is automatically discharged downstream. Normal pool is maintained at elevation 491.1 msl by the crest of the primary weir. Flood discharges which cannot be absorbed by storage and the primary weir, flow through the emergency spillway at pool elevations above 494 msl and through the secondary weir of the principal spillway at elevation 490 msl. The 6 inch diameter pipe at elevation 440 msl is manually operated and is used to lower the lake elevation below normal pool for maintenance purposes.

1. The first of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.

2. The second of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.  
3. The third of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.  
4. The fourth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.  
5. The fifth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.  
6. The sixth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.  
7. The seventh of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.  
8. The eighth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.  
9. The ninth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.  
10. The tenth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.

11. The eleventh of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.

12. The twelfth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.

13. The thirteenth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.

14. The fourteenth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.

15. The fifteenth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.

16. The sixteenth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.

17. The seventeenth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.

18. The eighteenth of these is the fact that the  
the system is not a simple one, and that it is  
not a simple one, and that it is not a simple one.

1. The first part of the report deals with the general situation of the country and the progress of the work during the year. It is a summary of the work done by the various departments and a statement of the results achieved. It is a general statement of the work done by the various departments and a statement of the results achieved.

2. The second part of the report deals with the work done by the various departments during the year. It is a detailed statement of the work done by the various departments and a statement of the results achieved. It is a detailed statement of the work done by the various departments and a statement of the results achieved.

3. The third part of the report deals with the work done by the various departments during the year. It is a detailed statement of the work done by the various departments and a statement of the results achieved. It is a detailed statement of the work done by the various departments and a statement of the results achieved.

4. The fourth part of the report deals with the work done by the various departments during the year. It is a detailed statement of the work done by the various departments and a statement of the results achieved. It is a detailed statement of the work done by the various departments and a statement of the results achieved.

5. The fifth part of the report deals with the work done by the various departments during the year. It is a detailed statement of the work done by the various departments and a statement of the results achieved. It is a detailed statement of the work done by the various departments and a statement of the results achieved.

6. The sixth part of the report deals with the work done by the various departments during the year. It is a detailed statement of the work done by the various departments and a statement of the results achieved. It is a detailed statement of the work done by the various departments and a statement of the results achieved.

7. The seventh part of the report deals with the work done by the various departments during the year. It is a detailed statement of the work done by the various departments and a statement of the results achieved. It is a detailed statement of the work done by the various departments and a statement of the results achieved.

8. The eighth part of the report deals with the work done by the various departments during the year. It is a detailed statement of the work done by the various departments and a statement of the results achieved. It is a detailed statement of the work done by the various departments and a statement of the results achieved.

9. The ninth part of the report deals with the work done by the various departments during the year. It is a detailed statement of the work done by the various departments and a statement of the results achieved. It is a detailed statement of the work done by the various departments and a statement of the results achieved.

10. The tenth part of the report deals with the work done by the various departments during the year. It is a detailed statement of the work done by the various departments and a statement of the results achieved. It is a detailed statement of the work done by the various departments and a statement of the results achieved.

THE  
JOURNAL  
OF  
THE  
ROYAL  
ANTHROPOLOGICAL  
INSTITUTE  
VOLUME  
LXXV  
PART I  
1905

PHOTOGRAPHIC EVIDENCE

On the day of the crime, a photograph of the car was taken. The photograph was taken from the front of the car, and the car was parked on the street.

A photograph of the car was taken on May 4, 1981. The photograph was taken from the front of the car, and the car was parked on the street. The photograph was taken at a distance of approximately 40 feet from the car. The photograph was taken at a time when the car was parked on the street.

A photograph of the car was taken on May 4, 1981. The photograph was taken from the front of the car, and the car was parked on the street. The photograph was taken at a distance of approximately 40 feet from the car. The photograph was taken at a time when the car was parked on the street.

A photograph of the car was taken on May 4, 1981. The photograph was taken from the front of the car, and the car was parked on the street. The photograph was taken at a distance of approximately 40 feet from the car. The photograph was taken at a time when the car was parked on the street.

A photograph of the car was taken on May 4, 1981. The photograph was taken from the front of the car, and the car was parked on the street. The photograph was taken at a distance of approximately 40 feet from the car. The photograph was taken at a time when the car was parked on the street.

A photograph of the car was taken on May 4, 1981. The photograph was taken from the front of the car, and the car was parked on the street. The photograph was taken at a distance of approximately 40 feet from the car. The photograph was taken at a time when the car was parked on the street.

A photograph of the car was taken on May 4, 1981. The photograph was taken from the front of the car, and the car was parked on the street. The photograph was taken at a distance of approximately 40 feet from the car. The photograph was taken at a time when the car was parked on the street.

A photograph of the car was taken on May 4, 1981. The photograph was taken from the front of the car, and the car was parked on the street. The photograph was taken at a distance of approximately 40 feet from the car. The photograph was taken at a time when the car was parked on the street.

was observed in this area.

The primary and secondary principal spillway weirs indicated no signs of deterioration or erosion (see photographs No. 3 and 4, Appendix II). The discharge channel below the principal spillway exhibited erosion on the side slopes (Photograph No. 6, Appendix II and field sketch 4, Appendix III). The emergency spillway was heavily overgrown with grass and some 2 - 3 inch trees were located below the control section. Intermittent riprap failures were noted along the shoreline as a result of embankment sloughing and wave action.

3.1.3 Reservoir Area: The reservoir area was free of debris and the perimeter was a combination of wooded area, orchard and pasture. The reservoir is located in a valley with side slopes at approximately 10 to 20H:1V. Sedimentation was visible at the south end of the lake near the approach channel to the right emergency spillway.

3.1.4 Downstream Area: The downstream channel consists of a 30 ft wide channel located in a valley with side slopes at approximately 4H:1V (Photograph No. 7, Appendix II). The downstream valley is heavily wooded with dense undergrowth. Approximately  $\frac{1}{4}$  mile downstream, one dwelling exists approximately 15 ft above the stream bed, and two homes are located 4 miles<sup>2</sup> below the dam approximately 10 ft above the stream bed.

3.1.5 Instrumentation: No instrumentation (monuments, observation wells, piezometers, etc.) was encountered for the structure. There is no staff gage.

### 3.2 Evaluation:

3.2.1 Dam and Spillway: Overall, the dam was in good condition at the time of the inspection. It is recommended that a routine maintenance program be initiated. The embankment, including its crest and slopes and the emergency spillway should be mowed at least once a

year, but more preferably twice a year. The presence of trees on the embankment, particularly those at pool level on the upstream slope, may promote the development of deep rooted vegetation and this type growth can encourage piping within an embankment. All trees growing on the embankment should be cut to the ground. Trees greater than 3 inches in diameter should have their stumps and root structures removed. Subsequent holes should be filled with compacted soil and seeded.

Erosion noted along the upstream slope is due to wave activity. It is recommended this erosion be corrected and that the riprap be replaced as necessary along the upstream slope to provide embankment protection. The animal burrows do not presently create an unsafe condition; however, future burrowing could result in numerous voids in the embankment which could be potentially hazardous under certain conditions. It is recommended that existing burrows be backfilled. The eroded areas observed in the discharge section of the principal spillway should be stabilized.

The seepage and iron staining observed below the discharge pipe is believed to be related to seepage through the dam. The strong upflow observed 115 ft to the right of the discharge pipe is believed to represent discharge from the chimney drain (described by Mr. Ritter) whose outlet is apparently covered with sediment. The iron stained area below the discharge pipe does not present a hindrance to the normal functioning of the dam, however, it is recommended this area be monitored quarterly to detect any flow which may cause piping in the embankment. If flows should occur, a Professional Engineer with expertise in Geotechnical Engineering should be contacted to evaluate the problem and make

recommendations for required corrective measures. It is recommended that the chimney drain discharge pipe be uncovered in order to allow its proper functioning. The marshy, saturated area located below the base of the emergency spillway is believed to be related to surface runoff or spring activity. No special attention is required.

A staff gage should be installed to monitor water levels.

3.2.2 Downstream Area: A breach in the Sleeter Lake Dam during extreme flooding would possibly create a hazard to the downstream dwellings.

#### SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures: The normal storage pool is elevation 491.1 msl or 0.1 ft above the crest of the primary overflow weir at the principal spillway inlet. The lake provides an irrigation supply and recreation. Water automatically passes through the primary principal spillway as the water level in the reservoir rises above the spillway crest. Water will also pass automatically through the emergency spillway when the water level in the reservoir reaches elevation 494 msl and through the secondary principal spillway when the pool level reaches elevation 495 msl. A 30 inch CMP outlet at elevation 446 msl is provided to drawdown the reservoir below normal pool.

4.2 Maintenance of Dam and Appurtenances: Maintenance is the responsibility of the owner. Maintenance consists of inspection, debris removal, mowing of vegetative cover and repair, but is not performed routinely.

4.3 Warning System: At the present time, there is no warning system or evacuation plan for the dam.

4.4 Evaluation: The dam and appurtenances are in good operating condition, however, maintenance of the dam appeared to be inadequate. Documentation of and a routine maintenance program should be developed for this structure. An emergency operation and warning plan should be developed. It is recommended that a formal emergency procedure be prepared and furnished to all operating personnel. This should include:

- a. How to operate the dam during an emergency.
- b. Who to notify, including public officials, in case evacuation from the downstream area is necessary.

## SECTION 5 - HYDRAULICS/HYDROLOGIC DATA

5.1 Design: Sleeter Lake Dam was designed by Earthworks, Inc. as a multi-purpose dam; however, hydrologic and hydraulic data are not available. According to Mr. Ritter the structure was designed to accommodate the 6 hour precipitation for a 100 year storm.

5.2 Hydrologic Records: There are no records available.

5.3 Flood Experience: The maximum pool elevation observed (according to Mr. John Sleeter) was approximately 2 ft above the emergency spillway or elevation 496 msl.

5.4 Flood Potentials: In accordance with the established guidelines, the Spillway Design Flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region), or fractions thereof. The Probable Maximum Flood (PMF) and  $\frac{1}{2}$  PMF were developed by the HEC-1 method (Reference 5, Appendix IV). Precipitation amounts for the flood hydrograph of the PMF were taken from U. S. Weather Bureau Information (References 6 and 7, Appendix IV). Appropriate adjustments for basin size and shape were accounted for. These hydrographs were routed through the reservoir to determine maximum pool elevation.

5.5 Reservoir Regulations: For routing purposes, the pool at the beginning of flood was assumed to be at elevation 491 msl. Reservoir stage-storage data and stage-discharge data were computed from field sketches and available topographic data. Floods were routed through the reservoir using the primary principal spillway discharge up to a pool storage elevation of 494 msl, a combined primary principal and emergency spillway discharges for pool elevations above 494 msl, and a combined

primary and secondary principal spillways and emergency spillway above elevation 495 msl. Pool elevations above 501 msl were routed over the non-overflow section of the dam.

5.6 Overtopping Potential: The predicted rise of the reservoir pool and other pertinent data were determined by routing the flood hydrographs through the reservoir as previously described. The results for the flood conditions ( $\frac{1}{2}$  PMF and PMF) are shown in the following

Table 5.1:

TABLE 5.1 - RESERVOIR PERFORMANCE

	Normal Flow	Hydrograph	
		$\frac{1}{2}$ PMF	PMF
Peak Flow, CFS			
Inflow	1	20,143	40,287
Outflow	1	19,097	40,287
Maximum Pool Elevation, Ft, msl	555	501.4	502.8
Non-Overflow Section, (Elev 501 msl)			
Depth of Flow, Ft		1.4	2.8
Duration, Hours		1	5
Velocity, ft/sec*		2.7	7.2
Tailwater Elevation, Ft, msl	446	461	468
*Critical Velocity			

5.7 Reservoir Emptying Potential: A 30 inch diameter CMP at invert elevation  $446^{+}$  msl is capable of draining the reservoir. Assuming that the lake is at normal pool elevation (491 msl) and there is no inflow, it would take approximately 10 days to lower the reservoir to elevation  $446^{+}$  msl. This is equivalent to an approximate drawdown rate of 4.5 ft/day based on the hydraulic height measured from normal pool to the invert of the drawdown pipe divided by the time to dewater the reservoir.

5.8 Evaluation: The U. S. Army, Corps of Engineers' guidelines indicate the appropriate Spillway Design Flood (SDF) for an intermediate size, significant hazard dam is the  $\frac{1}{2}$  PMF. The spillway will pass 4 percent of the PMF (80 percent of the SDF) without overtopping the crest of the dam. The SDF will overtop the dam a maximum of 0.4 ft at the low point and remain above the dam for one hour with a maximum critical velocity of 2.7 fps.



6.1.1. Embankment:

6.1.1.1. Material: The dam was designed as a homogeneous embankment. The native materials (CL) encountered on site were placed in the upstream and central portion of the dam. However, it is reported that the portion of the embankment was constructed with SC to SM materials (Unified Soil Classification). The fill was placed in 12 inch lifts (lift thickness) and compacted to at least 95 percent of maximum dry density, standard Proctor. Field density tests were performed by environmental lab personnel.

6.1.1.2. Drainage and Seepage: A chimney drain was constructed within the embankment to provide an internal drainage system. Mr. Ritter described the drain as being approximately 4 ft thick and constructed with masonry. A 12 inch perforated CMP was included along the base of the drain to collect seepage and pass it to a single discharge point approximately 10 ft (as best he can recall) to the right of the lake drain. The stream flow observed during the field inspection is believed to originate from the chimney drain. Mr. Ritter described the presence of a chimney drain outlet in this general area. The end of the chimney drain metal discharge pipe is apparently covered with sediment.

6.1.1.3. Staining: Iron staining observed immediately below the lake drain discharge pipe is believed to be the result of seepage through the dam. No flow was observed. A marshy area was observed along the base of the dam emergency spillway. No iron staining was observed in this area.

6.1.1.4. Stability: A stability analysis was not performed for this structure; however, we understand the embankment slopes were designed based upon individual experience with the Soil Conservation Service and Army Corps of Engineers. The dam is 55 ft high and has a crest width of 10 ft. Side slopes are approximately 3H:1V on the upstream and downstream slope of the dam.

The dam was designed as a homogeneous earth embankment and was to be built with soils generally ranging from 60 to 80% fines (less than 0.075 mm). It does, but includes some CL material in the center. The dam was subjected to rapid drawdown because the approximate reservoir drawdown rate of 4.5 ft per day exceeds the critical rate of 0.5 ft per day for earth dams. According to the designer, a stability analysis was not performed for this structure. However, it was reportedly designed according to G.I. and U. S. Army Corps of Engineers standards. No apparent instability was detected during the visual inspection. Based upon these facts, the embankment slopes are considered acceptable.

4.2.4 Seismic Stability: The dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, the dam is considered to have no hazard from earthquakes provided that stability conditions are satisfactory and conventional safety factors are used.

4.2.5 Height: An accurate check on the stability of this structure under full static loads was no stability analysis and laboratory test data available. The U. S. Bureau of Reclamation requirements (Reference 2, Appendix 10) are for small dams up to 50 ft in height. Although Sleeter Lake Dam is 55 ft higher than the maximum small dam height as defined by the Bureau of Reclamation, this difference is not considered great enough to disallow the use of Bureau guidelines in assessing the stability of this structure.

The downstream and upstream embankment slopes agree with the rapid drawdown requirements recommended by the U. S. Bureau of Reclamation; however, the embankment crest is approximately 6 ft too narrow. Overtopping is not considered detrimental to the dam with respect to erosion because of the depth and duration of flood and also the velocity is less than 6 fps, the effective eroding velocity for a vegetated earth embankment.

Based upon the visual inspection, the design and construction information and the performance history of this structure, the foundation is considered stable and a stability analysis is not required. Since no undue settlement, cracking, or seepage was noted at the time of inspection, it appears that the embankment is adequate for control storage at elevation 491 msl.

The marshy saturated area located below the base of the emergency spillway is believed to be the result of either accumulated surface runoff or spring activity. Iron stained areas observed immediately below the lake drain discharge pipe are believed to be related to seepage through the dam along the discharge pipe. This does not necessarily create an unsafe condition; however, these iron stained areas should be monitored periodically in attempt to detect any significant future flow which may result in piping within the embankment. The strong upflow observed 115 ft<sup>2</sup> to the right of the drain discharge pipe is believed to represent discharge from the chimney drain outlet, which is covered with sediment. The outlet should be uncovered and it is recommended that it be monitored in the future to verify proper functioning of the drain.

## 7.1.1.2. ASSESSMENT OF REMEDIAL MEASURES

7.1.1.2.1. Dam Assessment: There is insufficient information to evaluate foundation conditions and embankment stability. The visual inspection revealed no findings that proved the dam to be unsound. A routine maintenance program does not exist. Also, there is no emergency operation and warning plan. Overall, the dam was in good condition at the time of inspection. The dam was designed in accordance with SCS and Army Corps of Engineers standards and a stability check is not required. U. S. Army, Corps of Engineers' guidelines indicate the appropriate Spillway Design Flood (SDF) for this dam is the  $\frac{1}{2}$  PMF. The spillway will pass 40 percent of the PMF (80 percent of the SDF) without overtopping the crest of the dam. Flows overtopping the dam at a maximum velocity of 2.7 fps during the SDF are not considered detrimental to the embankment with respect to erosion. The spillway is judged inadequate but not seriously inadequate.

## 7.2 Recommended Remedial Measures:

7.2.1 Emergency Operation and Warning Plan: It is recommended that a formal emergency procedure be prepared, prominently displayed, and furnished to all operating personnel. This should include:

- 1) How to operate the dam during an emergency.
- 2) Who to notify, including public officials, in case evacuation from the downstream area is necessary.

7.3 Required Maintenance: It is recommended that a regular maintenance operation program be established and documented for future reference. Also, the inspection revealed the following maintenance items that should be scheduled by the owner during a regular maintenance period within the next 12 months.

7.3.1 The grass and weeds on the embankment in the emergency spillway should be cut at least once and preferably twice a year. Maintenance is recommended in the early summer and fall.

7.3.2 All trees and saplings present on the embankment and in the emergency spillway should be cut to ground level yearly during maintenance operations. Trees greater than 3 inches in diameter should have their root structures removed. Subsequent holes should be filled with compacted soil and seeded.

7.3.3 Eroded areas in the principal spillway discharge channel should be stabilized.

7.3.4 Erosion present at pool level along the upstream slope should be corrected and the riprap replaced as necessary.

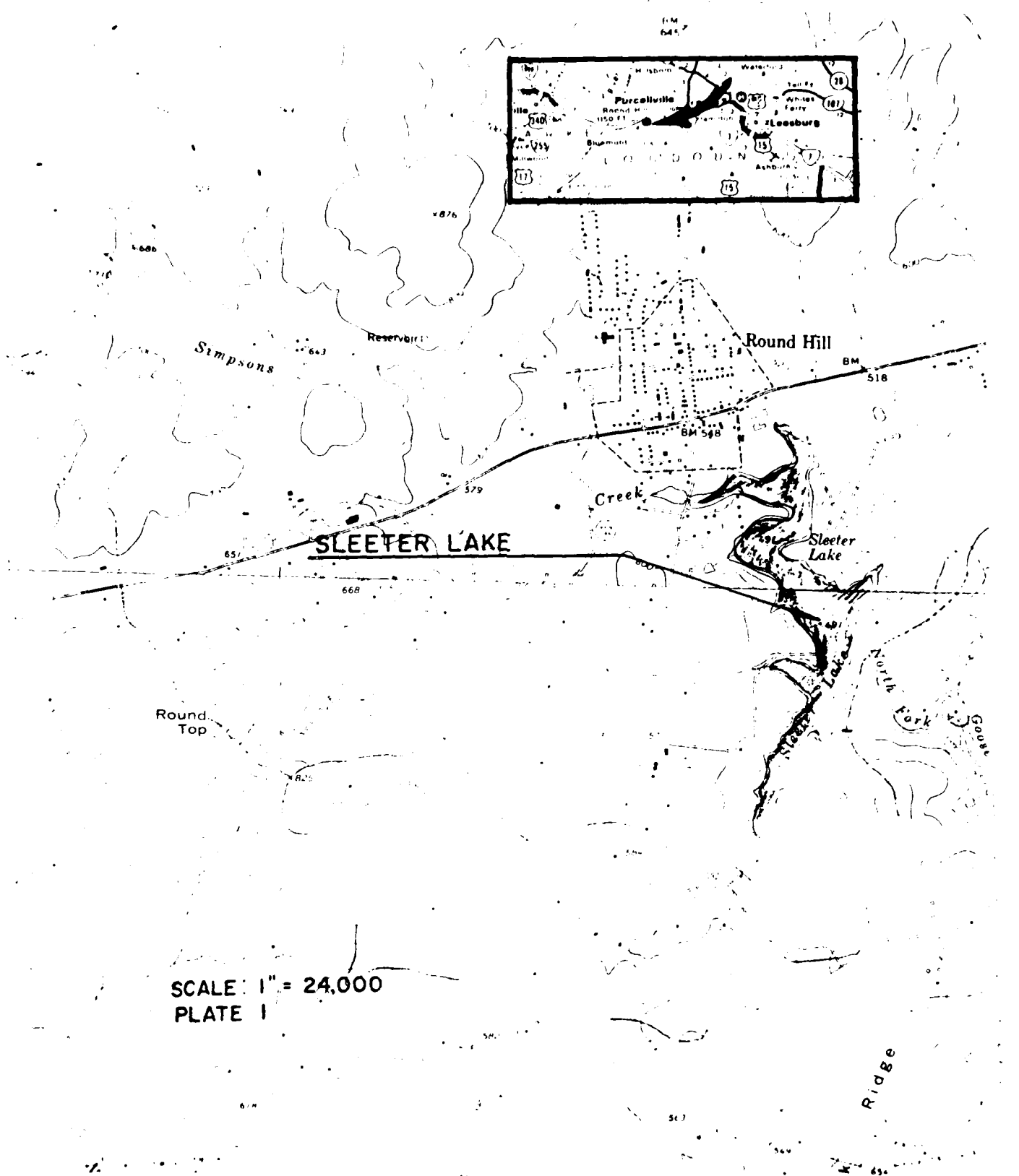
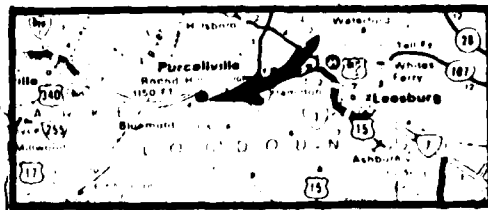
7.3.5 Animal burrows on the embankment should be backfilled.

7.3.6 Iron stained seepage present below the lake drain discharge pipe should be monitored quarterly to detect any flow. If flows should occur, a Professional Engineer with expertise in Geotechnical Engineering should be contacted to evaluate the problem and make recommendations for required corrective measures.

7.3.7 Sediment covering the chimney drain outlet should be removed and flows monitored quarterly to verify proper functioning of the drain.

7.3.8 A staff gage should be installed to monitor water levels.

APPENDIX I  
MAPS AND DRAWINGS



SCALE: 1" = 24,000  
PLATE I

ROUND HILL QUADRANGLE  
WEST VIRGINIA - VIRGINIA

APPENDIX II

PHOTOGRAPHS



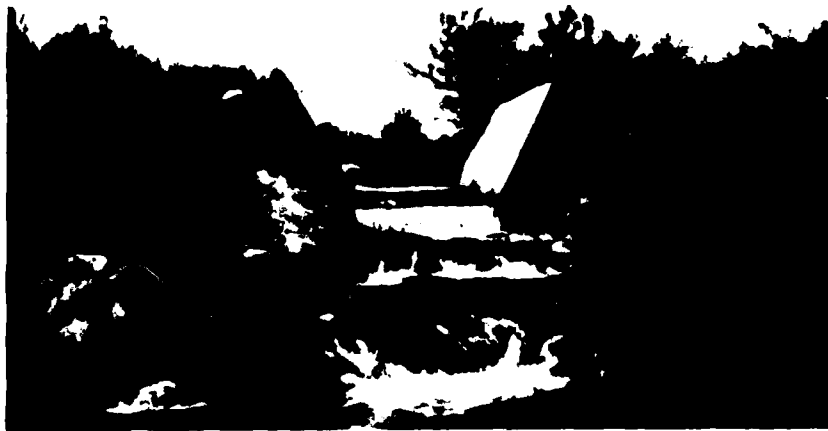
Photograph No. 1 - View Along Top of Dam  
and Upstream Face.



Photograph No. 2 - Downstream Face of Dam



Photograph No. 3 - Approach Channel and Weir



Photograph No. 4 - Discharge Channel



Photograph No. 5 - Emergency Spillway



Photograph No. 6 - Discharge Channel Confluence  
with the natural stream bed.



Photograph No. 7 - Looking Downstream  
from the Outlet Channel.

APPENDIX III  
FIELD OBSERVATIONS

Check List  
Visual Inspection  
Phase I

Dam Name Sleeter Lake County Loudoun State Virginia Coordinates Lat 39° 07.5' Long 77° 45.6'

Date(s) Inspection May 4, 1981 Weather Sunny-Clear Temperature 75°F

Pool Elevation at Time of Inspection 491 msl Tailwater at Time of Inspection 446 msl

Inspection Personnel:

Schnabel Engineering Associates, P.C.  
Gilbert T. Seese  
Stephen G. Werner  
Raymond A. DeStephen, P.E.\*

J. K. Timmons & Associates  
Robert G. Roop, P.E.  
Steve Oddi

State Water Control Board  
Hurch M. Gildon, P.E.

Gilbert T. Seese, Recorder

\* This person is not a registered professional engineer, but conducted the dam on June 15, 1981.

# REPORT

## FACTS OF INCIDENT

The slopes, crest and abutment of the dam were inspected and no cracks were noted. Ground conditions were noted at the time of the inspection.

## UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE

No unusual movements were noted on the dam or beyond the downstream toe.

## SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES

Along the upstream slope there is 1 to 4 ft<sup>+</sup> of vertical erosion above the existing pool level in the form of sloughing riprap and soil. It extends from the right spillway to the left spillway. Most of the sloughing is within 500 ft<sup>±</sup> of the left spillway.

Eroded areas should be repaired and riprap replaced

## VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST

The vertical and horizontal alignment of the dam appeared to be good.

## RIPPRAP FAILURES

Intermittent riprap failures were noted along the shoreline. Failures were in conjunction with 1 - 4 ft<sup>+</sup> of vertical erosion in and above the riprap. As a whole, the riprap was in rather good condition. The riprap consists of 1 to 3 ft<sup>±</sup> blocks of local rock.

Eroded areas should be repaired and riprap replaced in these areas

# EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LOCATION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DRY	The embankment lies in well with both abutments. The right abutment is vegetated and no rock was exposed. Surface soils are micaceous and appear to range from clayey silts (ML to MH) to silty sands (SM). Variably weathered Marshall Gneiss is exposed in the right abutment along the spillway channel. Foliation strikes N 33E and dips 38 SE. Three joint trends were measured: N70E, 81SE; N50W, 90; and N40E, 90.	See Field Sketch, Sheet 3
ANY NOTICEABLE SURFACE	Iron staining, probably related to seepage, was observed below the lake drawdown discharge outlet. The strong upflow of water (est. 5 gpd) was observed below water level at three locations.	See Field Sketch, Sheet 1
SEAMS	The lake drawdown valve was closed and there was no flow from the 48 inch pipe. The valve was not visible, apparently under water.	
MATERIALS	Reddish brown silt, some clay and fine sand (ML to MH).	
VEGETATION	The upstream and downstream slopes have considerable vegetation in the form of trees, briars, tall grass, etc. Most of the trees range from 1 to 4 inches in diameter and occur primarily along the shoreline on the upstream slope and the upper portion of the downstream slope. Scattered animal burrows were also encountered.	Vegetation should be controlled and animal burrowing backfilled

# PRINCIPAL SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CHANNEL SECTION	Principal spillway consists of a 40 ft long, 12 ft (bottom width) to 20 ft (top width) wide concrete trapezoidal channel spillway with 4H:1V side slopes. Controlled by a 24 ft by 12 ft (60 ft length) concrete overflow weir 3 to 4 ft high.	No cracks or spalling noted in the concrete.
APPROACH CHANNEL	A 72 ft wide grass secondary principal spillway is located 4 ft above the overflow weir.	In good condition
DISCHARGE CHANNEL	The channel is lined with weathered granite gneiss. The channel meanders where the bedrock is replaced by soil. Considerable erosion has occurred in the soil portions of the discharge channel.	See Field Sketch, Sheet 4. Erosion control needed.
BARGE AND PIERS	None	-
EMERGENCY GATE	Drain is 800 ft from emergency spillway. Valve stem is not visible. 30 inch corrugated metal pipe at drain outlet.	-
GATES AND OPERATION	-	-

# EMERGENCY SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTIONS	The emergency spillway consists of a 140 ft wide section with 2H:1V side slopes. The control section is 3 ft above pool level.	Well vegetated, but needs maintenance. No erosion noted.
APPROACH CHANNEL	Well-vegetated with grass, few 2 - 3 inch trees particularly along shoreline.	Grass should be cut and trees removed.
DISCHARGE CHANNEL	Well vegetated with grass, many 2 - 3 inch trees.	Grass should be cut and trees removed.
BRIDGE AND PIERS	None	-
MISCELLANEOUS	None	-

# RESTRICTION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR DOCUMENTATION
MONUMENTATION/SURVEYS	None observed	-
OBSERVATION WELLS	None observed	-
WEIRS	Overflow weir in principal spillway	-
PIEZOMETERS	None observed	-
STAFFGAGES	None observed	Should be installed
OTHER	-	-

# RESERVOIR

VISUAL EXAMINATION	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
--------------------	--------------	-----------------------------

## SLOPES

Wooded on the south end; otherwise, orchards and pastures bound the lake. Slight to moderate slopes (10H-20H:1V). New sewage treatment plant located just beyond the left abutment. The plant discharges into the principal spillway channel. The shoreline is stable with no erosion noted except along the upstream slope. There is a 10 ft wide wave berm below normal pool level. The reservoir area was free of debris.

## SEDIMENTATION

Visible at south end near approach channel to right spillway. Water is clear. No sedimentation noted around the approach to the principal spillway.

# DOWNSTREAM CHANNEL

## VISUAL EXAMINATION OF

## CONSTRUCTION

CONSTRUCTION  
(CONSTRUCTIONS,  
BARRIS, ETC.)

The downstream channel is 100' wide with steep slopes with 4H:1V slopes. The channel is heavily wooded with thick underbrush and tall grasses along both sides of the channel.

## SLOPES

10H:1V; heavily wooded

## APPROXIMATE NO. OF HOUSES AND POPULATION

1 house 1/4 mile downstream approximately 15 - 20 "

2 houses 4 miles<sup>+</sup> downstream approximately 10 "

Estimated population  
100 - 150  
100 - 150

CHECK LIST  
ENGINEERING DATA  
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
REGIONAL VICINITY MAP	Bluemont and Round Hill U.S.G.S. Topographic sheets (7 1/2 minute quadrangles).
DESIGN/CONSTRUCTION HISTORY	The dam was designed by Col. Paxton (deceased) of Earthworks, Inc., (no longer in business) and constructed by Lyon Construction Company of Vienna, Virginia. The dam was completed in 1962.
PLAN OF DAM	None available
TYPICAL SECTIONS OF DAM	None available
OUTLETS - PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	None available
SPILLWAY- PLAN SECTION DETAILS	None available
OPERATING EQUIPMENT - PLAN DETAILS	None available

ITEM	REMARKS
MONITORING SYSTEMS	None observed
RAINFALL/RESERVOIR WATERSHED RECORDS	None
GEOLOGY REPORTS	Geologic Investigation of the Lincoln and Bluemont Quadrangles, Virginia by E. F. Parker, Virginia Division of Mineral Resources, Reports of Investigations #14
BORROW SOURCES	Unknown
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY-FIELD TEST DATA	None available
HYDROLOGIC/HYDRAULIC DATA	None available

ITEM	REMARKS
DESIGN REPORTS	-
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	-
POST CONSTRUCTION ENGINEERING STUDIES RECORDS, SURVEYS	-
MODIFICATIONS	-
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	According to John Shuster, some erosion occurred around the principal spillway winnwall during filling of the lake in 1960 - 1967. The erosion was caused by heavy rainfall.
MAINTENANCE OPERATION RECORDS	-

Z

PASTURE

OVERFLOW WEIR

WASTEWATER  
TREATMENT  
PLANT

EFFLUENT DISCHARGE

SPILLWAY  
DISCHARGE CHANNEL

350'

DOWNSTREAM CHANNEL

LAKE DRAIN  
CHANNEL

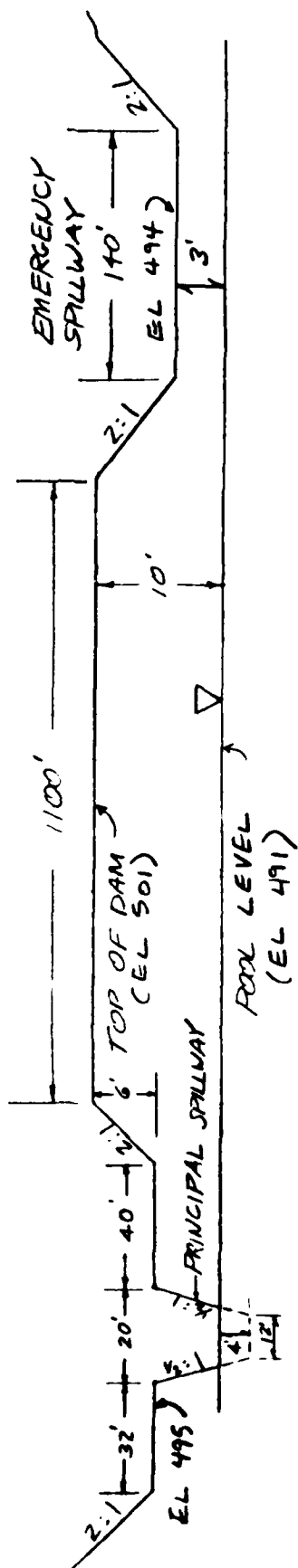
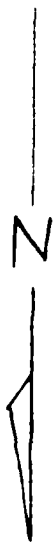
CHANNEL / LEAK (ETC?)

EMERGENCY  
SPILLWAY

140'

15'

PLAN  
SLEETER LAKE  
FIELD SKETCH #1  
SMA-11781

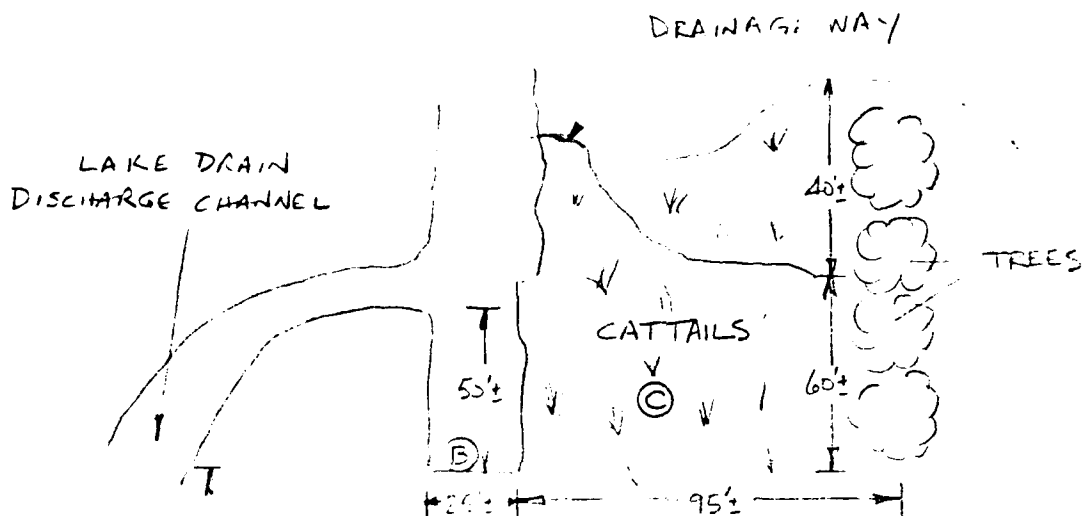


PROFILE  
SLEETER LAKE  
FIELD SKETCH 2  
5 MAY 1981

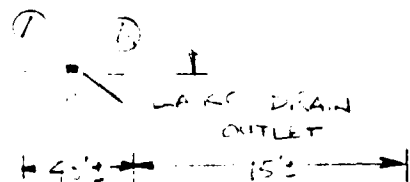
BY: [ ] DATE: [ ] SUBJECT: [ ]  
 CHKD BY: [ ] DATE: [ ]  
 STORAGE AREA  
 SLEETER LAKE 141

SHEET NO.  
 JOB NO.

N



115'±



NO SCALE

- (A) SCATTERED IRON STAINING
- (B) 3 SMALL BOILS WITHIN 4'± DIAMETER AREA, 1 1/2'± BELOW WATER LEVEL. FLOW ESTIMATED @ 5 GPM± FROM RIGHT. THE WATER WAS CLEAR. THIS MAY BE THE CHIMNEY DRAIN OUTLET
- (C) MARSHY, SATURATED AREA LOCATED AT BASE OF RIGHT EMERGENCY SPILLWAY. NO FLOW OR IRON STAINING OBSERVED

DISCHARGE CHANNEL

COVERED CHIMNEY / DRAIN OUTLET (?)

WELL

ROAD

SOUTH

S. 1/4 SEC. 16, T. 1N, R. 1E

- ② CAPRAE W/ 000005 15' IN WIND 20' IN WIND LEFT AIR MOUNT  
NA 20' LONG IN WIND AREA IS 15' LONG & 15' WIDE  
SUNSHINE & SOILS VISIBLE

2. On 10/2/2024 - see Photographs 1 - 6. APPENDIX III

#### APPENDIX IV - REFERENCES

1. Standard Guidelines for Safety Inspection of Dams, Department of Army, Office of the Chief of Engineers, 46 pp.
2. Design of Small Dams, U. S. Department of Interior, Bureau of Reclamation, 1974, 816 pp.
3. Geologic Investigation of The Lincoln and Blount Quadrangles, Virginia, by P. E. Parker, Virginia Division of Mineral Resources, Reports of Investigation No. 14, 23 pp.
4. Soil Survey, Loudon County, Virginia, U. S. Department of Agriculture, Soil Conservation Service, 1960, 118 pp.
5. 1978-1979 Peak Version, Flood Hydrograph Package, Users Manual for the Safety Investigations, the Hydrologic Engineering Center, U. S. Army Corps of Engineers, September, 1978.
6. Technical Report No. 23, U. S. Department of Commerce, National Oceanic and Atmospheric Administration, U. S. Department of Army, Corps of Engineers, Washington, D. C., April 1959.
7. Technical Report No. 4, U. S. Department of Commerce, Weather Service, Washington, D. C., May 1961.

END

DATE  
FILMED

11-81

DTIC